



## *What's after NAND?*

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Josef has 26 years of research and development experience in semiconductor memories at Siemens Semiconductor/Infineon Technologies/ Qimonda AG. Prior to joining Forward Insights, Josef was a principal at Qimonda Flash GmbH responsible for evaluating patents and intellectual property and developing innovative non-volatile memory technology and novel cell concepts to overcome the ultimate technology scaling constraints. He was named Infineon's Inventor of the Year in 2004 and is member of the technical committee for the International Memory Workshop (IMW).

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## About NamLab

NaMLab (**N**ano-electronic **M**aterials **L**aboratory)

The research at NaMLab focuses on materials for electronic devices and new device concepts. Among these are high-k materials for capacitors, transistors and other applications, novel switching devices including memristors, nanowire based electronics as well as materials for energy harvesting devices such as solar cells.

Future nano-electronic products require the development of new materials that are not currently available. NaMLab consequently focuses its research activities on materials and applications that show the potential to offer significant advantages over materials and products used today. In addition to investigating and characterizing new materials, NaMLab is undertaking research on the integration of these materials into semiconductor products with nano-scale dimensions.

NaMLab, originally founded as a research joint venture between Qimonda AG and the TU Dresden in July 2006, has its roots in the Corporate Research Department of Infineon AG and is now owned completely by the Technical University of Dresden. NaMLab receives basic financing from the Saxon Ministry of Science and Arts (SMWK). The company benefits from excellent working conditions in its office and clean room building opened in October 2007 and located within the TU Dresden campus.

Characterization:

- physical characterization (conductive AFM, SSRM, SEM)
- electrical device characterization;
  - 200mm/300mm wafer probe stations
  - 80K – 500K temperature range
  - Analytical measurements of memory cells (lifetime, switch time , storage and deletion windows)
  - charge carrier mobility with Hall and split-C(U)
- optical characterization (FTIR ellipsometry,  $\mu$ Raman and photoluminescence)
- dielectric reliability (TDDB, BTI, SILC)
- high-k material development
  - oxides: AlO, TiO, ZrO, HfO and mixtures
  - metals: Al, Pt, Au, TiN, Ti, Ru
  - methods: ALD, MBE, PVD, evaporation

Development:

- materials for emerging memories
- high-k stacks for capacitors and transistors
- development of new memory concepts
- charge trap device development
- development of explorative devices based on silicon nano wires



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## About Forward Insights

Forward Insights provides independent, insightful market research, consulting and information services focusing on semiconductor memories and solid state storage. The company offers unparalleled depth and understanding of the strategic, market and technical complexities of the semiconductor memory landscape.

### Services

Forward Insights offers a unique and comprehensive strategic, financial, market and technical perspective on the semiconductor memory industry. The professional services offered include:

- Strategy Consulting
- Financial & Cost Analysis
- Market Forecasts
- Technology Analysis
- Competitive Analysis
- Surveys
- Training
- Custom projects

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